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The attitudes of medical staff towards pain intensity assessment in newborns treated in the Neonatal Intensive Care Unit

Postawy personelu medycznego wobec oceny natężenia bólu u noworodków leczonych na Oddziale Intensywnej Terapii Noworodka

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STRESZCZENIE

POSTAWY PERSONELU MEDYCZNEGO WOBEC OCENY NATĘŻENIA BÓLU U NOWORODKÓW LECZONYCH NA ODDZIALE INTENSYWNEJ TERAPII NOWORODKA

Cel pracy. Zarządzanie bólem noworodków jest kluczowym elementem opieki na oddziałach intensywnej terapii, jednak często jest niedoceniane i niedostatecznie leczone. Celem tego badania było ocenienie wiedzy, postaw i praktyk personelu medycznego dotyczących bólu noworodków w warunkach intensywnej terapii, ze szczególnym uwzględnieniem pielęgniarstwa noworodkowego.
Materiał i metody. Przeprowadzono badanie przekrojowe wśród 127 pracowników służby zdrowia pracujących na oddziałach intensywnej terapii noworodków (OITN). Zastosowano metodę badania diagnostycznego, wykorzystując autorski kwestionariusz self-authored questionnaire (SAQ) uzupełniony o standaryzowany kwestionariusz bólu u niemowląt Infant Pain Questionnaire.
Wyniki. Analiza wykazała istotne różnice statystyczne (p=0,03) pomiędzy dwiema grupami: tymi, którzy ukończyli specjalizację w dziedzinie innej niż pielęgniarstwo noworodkowe (M=52,16%) i tymi, którzy specjalizowali się w pielęgniarstwie noworodkowym (M=68,47%). Uczestnicy z specjalizacją w pielęgniarstwie noworodkowym wykazywali znacznie wyższy poziom wiedzy. Poziom wykształcenia miał istotny wpływ na wiedzę na temat zarządzania bólem noworodków, z wartością p = 0,006. Analiza statystyczna przy użyciu testu chi-kwadrat Pearsona ($\chi^2 = 30,35$, df = 9, p = 0,00038) wykazała istotne powiązanie między specjalizacją zawodową a zalecaną ilością glukozy/sacharozy do podania.
Wnioski. Istnieje niepokojąca luka między rozpoznawaniem bólu u noworodków a faktycznym wdrażaniem strategii łagodzenia bólu. Różnica ta jest szczególnie widoczna w przypadku intubacji, gdzie zarządzanie bólem jest często niewystarczające.

Słowa kluczowe: leczenie, ból, wcześniactwo, noworodek, analgezja

ABSTRACT

THE ATTITUDES OF MEDICAL STAFF TOWARDS PAIN INTENSITY ASSESSMENT IN NEWBORNS TREATED IN THE NEONATAL INTENSIVE CARE UNIT

Introduction. Neonatal pain management is a critical aspect of care in intensive care units, yet it is often underestimated and undertreated. The aim of this study was to assess the knowledge, attitudes, and practices of medical personnel regarding neonatal pain in intensive care settings, with a particular focus on neonatal nursing.
Material and methods. A cross-sectional survey was conducted among127 healthcare professionals working in neonatal intensive care units (NICUs). A diagnostic survey method was applied, which included a self-authored questionnaire (SAQ) complemented by the standardized *Infant Pain Questionnaire*.
Results. The analysis revealed significant statistical differences (p=0.03) between two groups: those who completed a specialization in a field other than neonatal nursing (M=52.16%) and those who specialized in neonatal nursing (M=68.47%). Participants with a specialization in neonatal nursing had a significantly higher level of knowledge.. The level of education had a major impact on knowledge about pain management in newborns, with a p-value of 0.006. The statistical analysis using Pearson's chi-square test ($\chi^2 = 30.35$, df = 9, p = 0.00038) revealed a significant association between the professional specialisation and the recommended amount of glucose/sucrose to be administered.
Conclusions. There is a concerning gap between the recognition of pain in neonates and the actual implementation of pain relief strategies. This contrast is particularly evident in the case of intubation, where pain management is often inadequate.

Key words: treatment, pain, prematurity, analgesia, newborn

INTRODUCTION

Pain is commonly defined as an emotional or sensory experience that results from actual or potential tissue damage. It is a crucial component in assessing a patient's health, as it often signals the presence of damage or an increased risk of injury [1,2]. Neonatal pain, particularly in premature infants, presents a unique challenge due to the limited ability of newborns to communicate their pain. Over the past few years, neonatal care has advanced significantly, and healthcare professionals working in neonatal intensive care units (NICUs) have become increasingly aware of the risks associated with improper diagnosis, treatment, and nursing care, especially in relation to minimising or eliminating the pain experienced by neonates. However, despite the increasing awareness and advancements in neonatal care, the management of neonatal pain remains insufficiently addressed. Guidelines for managing pain in neonates are often not adhered to clinical settings, and the necessary tools, such as pain assessment scales, are frequently underutilized by healthcare teams [3,4]. Neonates, particularly preterm infants, often face the paradoxical reality that the more immature and critically ill they are, the more likely they are to undergo painful medical procedures, which are essential to improve their survival chances in the NICU [5,6]. Given these circumstances, it is essential to acknowledge that neonates require specialized care and pain management strategies, including non-pharmacological methods. These approaches, which may include soothing techniques such as positioning, touch, and the administration of concentrated glucose or sucrose, can be crucial in managing pain and ensuring neonatal comfort during medical procedures [7,8]. Non-pharmacological methods may be even more necessary in neonates in comparison to adults, as newborns are unable to verbalize their pain [9,10]. Successful treatment of neonatal pain is based on healthcare knowledge and education, as inadequate treatment can lead to non-optimal pain relief strategies [3]. Studies emphasize that healthcare professionals with specialist training in neonatal care are more likely to implement evidence-based pain management strategies [11]. Lack of awareness of neonatal pain perceptions has contributed to inadequate implementation of neonatal pain management in the recent past. Continuing medical education and standardised guidelines are essential for improving pain management practices in neonatal intensive care units (NICUs). In this regard, improving the quality of neonatal pain management and patient outcomes can significantly improve the treatment of neonatal pain.

AIM

The aim of the study is to assess the knowledge, attitudes, and professional practices regarding pain management in neonates among healthcare providers working in NICUs. By evaluating current practices and identifying potential gaps in knowledge, the present research will contribute to improving pain management strategies in neonatal care. The findings of this study are particularly relevant in view of existing gaps in evidence-based practices and the need for continuous education and improvement in the management of neonatal pain.

MATERIALS AND METHODS

Population settings

The study was conducted at the Department of Obstetrics and Gynecology at the University Clinical Hospital in Wrocław, Poland, with the approval of the hospital's management. A total of 128 respondents participated in the study. Out of the 128 received questionnaires , one was excluded due to non-fulfillment of the participation criteria. The study's inclusion criteria required proper completion of the questionnaire and active membership of the medical staff. The study was fully anonymous, and completion of the questionnaire was considered as giving informed consent for participation in the study.

Ethical considerations

Ethical approval for the study was obtained from the Bioethics Committee No. KB-754/2019 at the Medical University of Silesia in Wrocław.

A diagnostic method

A diagnostic survey method was employed, utilising a self-authored questionnaire complemented by the standardized Infant Pain Questionnaire in its Polish version. The questions in this instrument address the intensity of pain experienced by newborns in comparison to adults, the painfulness of medical procedures, the frequency of procedures performed with pain-relief measures, and the situations in which these measures should be applied [12,13].

The self-authored questionnaire (SAQ) consists of 23 questions, divided into two sections. The first section is a demographic section containing a total of 11 questions, including 3 questions about sociodemographic data (age, gender, education), and 8 questions about work-related data (profession, specialization, department, additional courses). The second section (open-ended) contains 12 questions related to the topic of newborn pain, pain relief methods, pain assessment scales, and the respondents' subjective opinions and attitudes. Question No. 21 refers to the effectiveness of non-pharmacological pain relief methods, where respondents could rate their effectiveness on a scale from 1 to 5, where 1 means the method is definitely effective, and 5 means definitely ineffective. Question No. 23 is an open-ended question directed solely at staff working in neonatal units, asking which scales are used to assess newborn pain in their workplaces.

Statistical tools

The study analyzed both quantitative and qualitative variables. The analysis of each variable was conducted by appropriate statistical tools. To characterize the structure of the examined variables, basic descriptive statistics, such as measures of central tendency and variability, were calculated. In order to determine the strength of associations between variables, Pearson's linear correlation coefficients and Spearman's rank correlation coefficients were calculated . The t-test for independent samples, one-way analysis

of variance (ANOVA), and post-hoc Tukey's multiple comparisons tests for unequal sample sizes were used to verify whether demographic data significantly differentiated the level of knowledge among the study participants. For variables measured on ordinal and nominal scales, frequencies and structural indices were calculated, and hypotheses about the independence of two qualitative features in the population were tested. The Pearson's Chi-square (χ^2) test was the most commonly used tool for this purpose. A significant level of 0.05 was adopted for all analyses. All statistical analyses were performed using Statistica v.13 software.

Characteristics of the study group

The study included 127 completed surveys, with 126 respondents being female. Among the study population , the largest group were midwives - 89 people (70.08%), the second largest group were nurses, who constituted 21.26%, then physiotherapists with a share of 5.51%, while the smallest group were doctors constituting 3.15% of the study group. Most of the respondents, 70 individuals (55.12%), holds a bachelor's degree, followed by 50 respondents (39.37%) with a master's degree, 5 respondents (3.94%) with a vocational education, and only 2 respondents (1.57%) holding a doctoral degree. Most of the participants (33.07%) had less than 1 year of professional experience. Respondents with 2 to 5 years of experience accounted for 30.71%, while 14.17% had 6 to 10 years of experience. Those with 11 to 20 years of experience represented 8.66%, and 11.81% of participants had 21 to 30 years of experience. Only 2 participants (1.57%) had more than 35 years of professional experience. More than half of the respondents (51.97%) reported not having completed any qualification courses. Seven individuals (5.51%) completed a qualification course in neonatal nursing, and another seven (5.51%) completed a course in anesthesiology and intensive care nursing. The remaining 47 participants (37.01%) completed other qualification courses. Twelve-point six percent (12.6%) of the respondents reported completing a specialization in neonatal nursing, while 1.57% had completed a specialisation in anesthesiology and intensive care nursing. Another 13.39% had a specialization in another field, while the remaining 72.44% of respondents had not completed a specialization. When analysing the work experience of the survey respondents , the largest group were people working for less than a year - 33.07%, in second place were people with work experience between 2 and 5 years, constituting 30.71%, the third group was people working in the profession between 6 and 10 years - 14.17%, the fourth largest group were people working between 21 and 30 years - 11.81%, while the smallest groups were people with work experience of 11-20 years - 8.66% and those working over 35 years - 1.57%.

Correlation analysis between studied variables

The analysis of the dependent variable knowledge revealed an average score of 59.04% with a median of 60.00%, indicating that half of the respondents received at or below this value. The minimum score was 13.33%, while the highest observed score reached 88.89%, demonstrating a wide range of knowledge levels among the participants. The SD of 16.90% suggests a considerable dispersion of results around the mean. Furthermore, the coefficient of variation (28.63%) indicates a moderate level of variability within the dataset, reflecting substantial differences in knowledge levels across the surveyed medical personnel.

Tab. 1. Descriptive statistics

	M	Me	Min	Max	SD	(%)
Knowledge	59.04%	60.00%	13.33%	88.89%	16.90%	28.63%

M – mean, SD – standard deviation, Me – median, Min. – minimum value, Max. – maximum value.

Correlation analysis assessed the relationship between knowledge level (percentage of correct responses) and work experience variables using **Spearman's rank correlation coefficient** (R).

- The correlation between the percentage of correct responses and the **total of work experience** (N = 127) was weak and negative (R = -0.09), indicating a slight inverse relationship. However, this association was not statistically significant (t = -0.99, p = 0.33), suggesting that longer professional experience does not necessarily correlate with higher knowledge levels.
- Similarly, the correlation between the percentage of correct responses and **the length of service at the current workplace** was negligible (R = 0.01). The test statistics (t = 0.14) and p-value (p = 0.89) confirm the absence of a meaningful relationship, indicating that the duration of employment at the current institution does not significantly impact knowledge levels.

These results suggest that neither total work experience nor the length of service at a specific workplace play a decisive role in determining knowledge levels regarding the neonatal pain management (Tab. 2).

Tab. 2. Correlation between knowledge level and work experience variables

Variables	N	R	t(N-2)	p
Percentage of Correct Answers & Total Work Experience	127	-0.09	-0.99	0.33
Percentage of Correct Answers & Current Work Experience	127	0.01	0.14	0.89

Tab. 3 presents the results of a one-way Analysis of Variance (ANOVA) assessing the differences in the percentage of correct answers (knowledge level) across different education levels. The F-value of 4.41 indicates a statistically significant variation in knowledge levels between the studied groups, with a p-value of 0.006, which is below the commonly accepted significance level of 0.05. This suggests that education level significantly influences the knowledge about neonatal pain management. Further post-hoc analyses would be needed to determine which specific educational groups differ from each other in terms of their knowledge level.

Tab. 3. One-Way analysis of variance ANOVA for percentage of correct answers by education level

Variable	F-value	p-value
Percentage of Correct Answers	4.41	0.006

This tab. 4 presents the results of the Tukey's Post-Hoc Test for multiple comparisons, evaluating the differences in knowledge levels between participants with different professional specializations. The median results represent the percentage of correct answers for each specialisation group. The analysis revealed significant statistical differences (p=0.03) between two groups: those who completed a specialization in a field other than neonatal nursing (M=52.16%) and those who specialised in neonatal nursing (M=68.47%). This suggests that participants with a specialisation in neonatal nursing exhibited a significantly higher level of knowledge than those with a specialization in another field. The table shows the p-values for all pairs of comparisons between the groups. The only significant difference was found between the group with a specialisation in neonatal nursing and the group with a specialisation in a different field. The p-values for other comparisons, including that between neonatal nursing and anesthesiology/intensive care, did not reach statistical significance ($p > 0.05$). This confirms the importance of specific training in neonatal care for improving knowledge about neonatal pain management.

Tab. 4. Post-hoc Tukey's multiple comparisons – professional specialisation

Professional specialisation	{1} M=58,91	{2} M=52,16	{3} M=68,47	{4} M=47,78
No specialisation completed {1}		0,63	0,36	0,91
Specialisation in a Different Field {2}	0,63		0,03	0,99
Specialisation in Neonatal Nursing {3}	0,36	0,03		0,59
Specialisation in Anesthesiology and Intensive Care Nursing {4}	0,91	0,99	0,59	

Tab. 5 presents the distribution of responses regarding the recommended amount of concentrated glucose or sucrose administered for neonatal pain relief, categorized by the respondents' professional specialization. The statistical analysis using Pearson's chi-square test ($\chi^2 = 30.35$, df = 9, p = 0.00038) revealed a significant association between the professional specialisation and the recommended amount of glucose/sucrose to be administered. This indicates that the professional background of participants influences the choices made regarding the appropriate dosage for neonatal pain management. This result highlights the importance of specialised training in neonatal care and pain management, as well as the need for clear guidelines development and education to ensure consistent and effective pain relief practices across healthcare providers.

- **Do not know:** Most individuals without a specialisation (46.74%) and those with a specialisation in anesthesiology/intensive care nursing (50.00%) report that they do not know the recommended amount. A significant number of respondents with a specialisation in a different field (64.71%) also fell into this category. However, there were no respondents with a specialisation in neonatal nursing who indicated a lack of knowledge.
- **Amount is not significant:** A small number of respondents (4.35%) who did not complete any specialisation indicated that the amount of glucose/sucrose is not significant. Respondents with a specialization in other fields (12.50%) and those, who specialised in neonatal nursing (0%) gave similar responses, while no one in anesthesiology and intensive care nursing reported this view.
- **0.1-0.2 ml:** A small number of respondents (16.30%) without specialisation, 0% of those with a specialisation in a different field, and 31.25% of those with a specialisation in neonatal nursing, and 50% of respondents with a specialisation in anesthesiology and intensive care nursing, suggested that the appropriate amount is 0.1-0.2 ml of glucose/sucrose.
- **1-2 ml:** This answer was most often chosen by people with a neonatology specialisation - 56.25%, people with another specialisation chose this answer in 35.29%, 32.61% of people without specialisation also chose this answer. Notably, none of the respondents in the anesthesiology and intensive care nursing group recommended this range.

Tab. 5. Recommended amount of concentrated glucose/sucrose to be administered before a medical procedure for pain relief in neonates, based on professional specialisation

Professional Specialisation	No Specialisation Completed	Specialisation in aDifferent Field	Specialisation in Neonatal Nursing	Specialisation in Anesthesiology and Intensive Care Nursing	Total
Do not know	43	11	0	1	55
%	46.74%	64.71%	0.00%	50.00%	
Amount is not significant	4	0	2	0	6
%	4.35%	0.00%	12.50%	0.00%	
0.1-0.2 ml	15	0	5	1	21
%	16.30%	0.00%	31.25%	50.00%	
1-2 ml	30	6	9	0	45
%	32.61%	35.29%	56.25%	0.00%	
Total	92	17	16	2	127

Pearson's $\chi^2 = 30.35$, df = 9, p = 0.00038

DISCUSSION

The aim of this study was to assess the knowledge, attitudes, and professional practices of medical staff regarding the pain experienced by neonates admitted to NICU. The results of the study indicate a diverse level of knowledge among the participants, with an average of 59.04% correct answers ±16.90%. This variability (V > 20%) suggests that while some professionals demonstrate good level of understanding, there is room for improvement in the overall knowledge base. The highest level of knowledge was observed among midwives with specialization in neonatal

nursing, particularly those working in level III reference hospitals. This finding aligns with the study of Al Quadire et al., who also noted that specialised training in neonatal care is crucial for improving knowledge and practices related to neonatal pain management[14].

The lack of a significant correlation between staff age and knowledge is consistent with the findings of Van Niekerk et al., who observed that younger staff members, despite having less experience, often possessed greater knowledge on the subject[15]. This may be attributed to a higher level of motivation and a stronger tendency to seek updated information, which can decline with longer work experience. This finding highlights the critical role of continuous education and professional development, particularly in neonatal care, where advancements and best practices evolve rapidly. The study also revealed a concerning misconception among 60.63% of respondents, who believed that all types of neonatal procedures, including arterial, venous, and heel pricks, caused the same level of pain. This is consistent with findings from Panek's research, where 71% of participants shared similar opinions[16]. Additionally, only 20.47% of the respondents correctly identified capillary blood collection as the most painful procedure for neonates. These findings underscore the need for enhanced education regarding pain assessment and management in neonates, especially considering that neonates are highly sensitive to pain and stress, which can have long-term developmental consequences [17,18].

An essential issue that was identified in this study was the inconsistency between the recognition of the painful nature of procedures and the implementation of adequate pain management strategies. The findings indicate that despite recognizing the pain associated with procedures such as intubation, medical staff often failed to implement preventive or relieving measures to alleviate it. This inadequacieshighlight the need for better adherence to evidence-based pain management protocols and integration of standardized guidelines into clinical practice. Similar findings were reported by Akuma et al. and Jordan, whose study of 239 neonatal units in the United Kingdom of Great Britain demonstrated that only 37% of units utilized pain relief before intubation[19]. Additionally, 22.05% of our respondents noted that pain management during intubation is rarely used in clinical practice. This is particularly concerning according to that Polish neonatal care standards emphasize the necessity of premedication before intubation.

The use of non-pharmacological pain relief methods in neonatal care has demonstrated significant advantages. These methods are cost-effective, easy to implement, and carry a low risk of complications. Moreover, non-pharmacological techniques promote neuropsychomotor development and modulate the pain response by inhibiting the release of neurotransmitters responsible for amplifying the initial painful stimuli. The findings of the study support the critical role that nurses and midwives play in neonatal pain management, as they are often the first line of contact and spend the most of time with newborns. Additionally, nurses and midwives are typically the primary healthcare professionals responsible for preparing newborns for procedures and can implement these methods independently [20-22].

Interestingly, the study participants identified glucose/sucrose administration, positioning, and noise reduction as the most effective non-pharmacological methods. These results aligned with those of Maciel et al., who found that positioning (25.8%), environmental control (such as light reduction (20.4%) and noise reduction (18.8%)), and maintaining minimal handling (12.5%) were the most frequently reported non-pharmacological pain management techniques[2]. Similarly, Swedish studies on 120 neonates revealed that the administration of 1 ml of 30% glucose prior to venipuncture led to a complete absence of pain response during the procedure [8]. These findings further emphasize the efficacy of non-pharmacological pain relief methods and their positive impact on the neonatal pain management.

Limitations of the study

The present study has several limitations that must be acknowledged, while providing valuable insights into the knowledge and practices of healthcare professionals regarding neonatal pain management.,. First, is a pilot, single-center study conducted within a specific healthcare institution, which limits the generalizability of the findings to other settings or regions. The results may not fully represent the broader healthcare landscape or the diverse practices of professionals working in various NICUs across different countries or healthcare systems. Additionally, the relatively small sample size and the focus on a single center restrict the scope of the conclusions that can be drawn from the study. The heterogeneity in professional backgrounds, along with differing levels of experience and specialization, may have contributed to variability in the responses, which may not be fully representative of the general population of healthcare workers. Finally, the cross-sectional design of the study limits the ability to draw conclusions about causality. While the associations observed between specialization and knowledge levels are statistically significant, they do not indicate a causal relationship. Future research should consider longitudinal or multi-center studies to explore the underlying factors that influence neonatal pain management practices in a more comprehensive manner. To address these limitations, future studies are planned to extend the research to multiple centers, allowing for a larger and more diverse samples. This will provide a more representative analysis and enable more robust comparisons across different healthcare institutions.

CONCLUSIONS

The study's findings highlight several key points that need attention in clinical practice:

1. **Specialization and knowledge:** Personnel working in level III reference hospitals with specialized neonatal nursing education demonstrate significantly higher knowledge regarding neonatal pain. This reinforces the need for specialized training and continuous education in neonatal pain management.

2. **Underutilization of non-pharmacological methods:** Despite their recognized effectiveness, non-pharmacological pain relief methods, such as glucose/sucrose administration, positioning, and noise or light reduction, are underused in clinical practice. It is essential to raise awareness about the importance of these methods and encourage their routine use in neonatal care.
3. **Gap between pain recognition and management:** There is a concerning gap between the recognition of pain in neonates and the actual implementation of pain relief strategies. This discrepancy is particularly evident in the case of intubation, where pain management is often inadequate.

Recommendations for Practice

It is essential to adopt pain assessment scales and ensure that pain relief measures are routinely applied during neonatal procedures. Additionally, increasing the autonomy of nurses and midwives in pain management and providing them with access to appropriate resources and tools will contribute to improving care quality in neonatal intensive care units.

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